Washington.—The mean temperature was 47.0°, or 1.5° below normal; the highest was 80°, at Lind on the 15th, and the lowest, 18°, at Cedonia on the 13th. The average precipitation was 3.80, or about 0.50 above normal; in the western section it was about 1.50 above normal; the greatest monthly amount, 14.01, occurred at Clearwater, and the least, 0.7, at Moxee. The month was cold throughout, the temperature being the lowest of any April since 1896, and the spring the most backward since 1893. Farming operations have been greatly delayed, and crops have made poor progress.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 53.4°, or 1.2° above normal; the highest was 93°, at Morgantown and Uppertract on the 30th, and the lowest, 18°, at Beverly on the 5th. The average precipitation was 1.84, or 1.12 below normal; the greatest monthly amount, 3.17, occurred at Charleston, and the least, 0.92, at Oldfields.—*C. M. Strong.*

Wisconsin.—The mean temperature was 47.2°, or about 2.0° above normal the lowest temperatures occurred from the 1st to the 3d, and the highest from the 25th to 29th. The average precipitation was 2.42, or slightly below normal; the distribution was excellent.—*W. M. Wilson.*

Wyoming.—The mean temperature was 41.5°, or about normal; the highest was 92°, at Carbon on the 24th, and the lowest, 3° below zero, at Sheridan on the 1st. The average precipitation was 0.86, or 0.60 below normal; the greatest monthly amount, 2.30, occurred at Fort Yellowstone, while none fell at Cody and Wamsutter.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

SUN SPOTS AND HAWAIIAN ERUPTIONS.

By CURTIS J. LYONS (dated Honolulu, April 27, 1897.)

The following table showing the relation between the years of least sun spots, as actually observed by astronomers, and the dates of the more prominent volcanic outbursts on Hawaii certainly suggests some connection between the two. The sun-spot periods are from the United States MONTHLY WEATHER REVIEW for December, 1897:

Years of minimum sun spots.	Years of most important lava flows or eruptions.
(?)	1790 (Kilauea Keoua eruption)
1799	1801 Hualalai.
1810	(?)
1823	1823 Mauna Loa.
1833	1832 Mauna Loa and Kilauea.
1843	1840 Kilauea. 1843 Mauna Loa.
1856	1852 1855 Mean 1856, Mauna Loa. 1859
1867	1868 Mauna Loa.
1878	1880-81 Mauna Loa.
1889	1887 Mauna Loa, south slope.
1900 (Probable)	....

The variation in number of sun spots during the average 11-year cycle is strongly marked, the ratio of maximum to minimum being about as 80 to 10, and sometimes greater. It is an accepted fact, I believe, that the solar heat is slightly greater when there are the fewest spots, but how this should cause volcanic outbreak does not appear. It may be the expansion, on account of solar heat, of a fluid interior breaking through a rigid crust.

The next minimum period is due about 1900, as near as can be estimated from past intervals, so without being in any way alarmists, it is reasonable for us to look for a probable lava flow at some time between now and 1901. The Hawaii lava flows are generally confined to desolate parts of the island.

This is not to be considered as a prediction but simply a statement of facts. The lava flows of Mount Ætna have followed, in a measure, the same period.

NOTE.—We publish the above note at the request of Mr. Lyons, but must call attention to the fact that if there be any causal connection, or any true chronological coincidence between the minimum sun spots and the important eruptions on Hawaii, then this relation should, also, be established by studying the agreement of the years of maximum sun spots with the years of no eruption. The above paper presents only one side of the question; the truth can only be attained by studying all sides, and by demonstrating that the eight approximations here quoted were not purely accidental. Everything points to an intimate connection between solar, terrestrial, and cosmic phenomena, but the nature and limitations of this connection can only be ascertained by a more elaborate study of such hypotheses as are implied in the above interesting note by Mr. Lyons.—ED.

A TALK ON ELEMENTARY METEOROLOGY.

By GEORGE MILLARD DAVISON, A. B.

[Given before the Teachers' Institute of Fulton County, N. Y., April 11, 1899.]

NOTE.—This present paper by Mr. Davison, principal of Gloversville High School, illustrates the general style of a popular lecture for teachers and scholars. The subject of meteorology is now being introduced into all the public schools as a necessary subject of instruction. The subjects touched upon in Mr. Davison's lecture before the Teachers' Institute of Fulton County would, of course, be treated more at length in several separate talks when the teachers present the matter to young pupils. The general object of such a lecture is to give the teachers briefs of points that must be elaborated in the class room. In the present crude condition of instruction in meteorology it is, of course, not to be expected that the most advanced physical theories with regard to atmospheric phenomena shall be presented to young pupils, or even that they should be understood by all the teachers. The subject must first be taught more thoroughly, both by the study of nature and of text-books, in the universities, colleges, and normal schools. Meanwhile elementary lectures, such as this by Mr. Davison, will serve as a model for plain talks to the children and their teachers.—ED.

In discussing the subject of meteorology, to-day, I shall not limit it to its commonly accepted meaning, as that which concerns the weather, but shall treat it in its general meaning as seen in the derivation of the word, namely, phenomena which have to do with air; nor shall I discuss obscure things, about which even scientists know comparatively little, but shall talk of ordinary phenomena, with which all are more or less familiar.

To the child all space seems empty, except that which is occupied by something he can see or touch, as houses, trees, rocks, etc. Air he does not see; but if you put into his hand a fan and ask him to wave it vigorously to and fro, he will discover that the fan meets with resistance which can only be overcome by the exertion of muscular effort on his part. In this way you can prove to him that air is a real, tangible substance. That it is made up of several different substances you can show by this simple experiment: If in a saucer partly filled with water I place a lighted candle and over it invert a tumbler so that the lower rim is slightly immersed in the water, the candle soon goes out. The fact that the water is drawn up into the tumbler shows that the volume of air has been diminished. If now I lift the tumbler carefully and put in a lighted match, the match goes out, showing that the tumbler contains a substance which will not burn nor support combustion. This is chiefly nitrogen. The other substance of which air is largely composed—that which enables fire to burn and which was exhausted when the tumbler was placed over the lighted candle—is oxygen. It is oxygen which, when taken into the lungs, cleanses the blood and thus supports life.

Several minor substances are also contained in air, the one of chief importance for our consideration is water in the form of invisible vapor. Its presence can be detected by means of crystals of calcium chloride. These crystals are very greedy of moisture, and when exposed in the air draw up the moisture to such an extent that they often liquify, thus proving the presence of moisture in the air. I have set some crystals of calcium chloride on the shelf under the clock which it might be well for you to notice later and see if they have undergone any change. Calcium chloride can be purchased at any drug store, but you must be careful to explain that you want what is known to chemists as calcium chloride, not that which is ordinarily known as bleaching powder, which is a chloride of lime. The entire space occupied by the atmosphere also contains moisture which exists at sometimes and in some places more densely than in others. At times the space becomes so completely filled with moisture that it can contain no more, and any further moisture is deposited in visible form on the window panes and woodwork of a room. When the atmosphere is in this condition it is said to be saturated. Let us suppose we had in this room a tub of water, so arranged that it will evaporate very slowly. *If moisture is given off too fast it appears in* the form of steam. If this slow evaporation be kept up long enough the air becomes saturated, and the moisture from the tub will finally become visible on the window panes and elsewhere. Or if we stop the evaporation before the air becomes quite saturated and lower the temperature a few degrees, we shall notice, if we watch the thermometer and observe the condition of the windows, the same result, i. e., that before the temperature has fallen very far the air becomes saturated and moisture is deposited. The temperature at which air will no longer contain its moisture is called the dew-point. Place a pitcher of ice water, preferably a metal one, in the moist air of a warm room. The ice cools the water and pitcher, which in turn cools the air in contact with it below the dew-point, so that some of the moisture in the room is deposited on the pitcher which is said to sweat. Let us apply this principle a little further. Suppose we transfer our thoughts to an evening in June. The day has been warm and the atmosphere is filled with moisture nearly to saturation. When the sun sets, the warm air rising from the earth gives place to cooler air. Heat is radiated or given off from objects on the surface of the earth. It leaves some objects more freely than others; grass gives off its heat most easily and is not otherwise warmed up, therefore, it is the first to cool below the dew-point. The air in contact with it having been cooled to saturation, deposits its moisture on the grass very early in the evening. You may prove this by walking through the grass with a pair of highly polished shoes soon after sundown. Dew forms on various objects in the order in which they radiate heat and fall below the dew-point, the list being, as you have it on the outline schedule of lectures, i. e., grass, wool, cotton, linen, silk, wood, earth, stone, metal.

If the night is a fairly cool one we find when morning comes that dew has formed on nearly everything in sight, small stones and pieces of metal being covered, and even the dust in the street is laid to a certain extent. Certain conditions prevent the formation of dew. A handkerchief or sheet spread over a grass plot or rose bush will prevent the radiation of heat from the objects covered, and the consequent formation of dew on them, though the upper surface of the handkerchief will be found wet. An open shed protects the ground and objects underneath from dew, and a clearly marked line can be found bounding the protected dry surface from that wet with dew. It may have been this that led the ancients to the general impression that dew falls as rain from the sky and the expression, "falling dew," although erroneous, is prevalent in all quarters at the present time. Let us be careful hereafter to speak of the forming, not the falling of the dew. We can readily see how in a similar way clouds act as a preventive of dew. Hanging low over the earth they form a covering that checks the radiation of heat and consequent falling of temperature below the dew-point, so that a cloudy night, generally speaking, is not a dewy one. This is also true of a windy night, for by constantly changing the air in contact with objects on the earth's surface before it has time to cool below the dew-point the wind prevents the deposit of moisture. A cool, clear, still night after a warm day is then most favorable for the formation of dew. The question why we fan ourselves may be interesting in this connection. The reason seems to be this: Air in contact with the surface of the body absorbs moisture or perspiration till saturated. Now when moisture in any visible form is changed to vapor, or the invisible form, heat is absorbed which in this case is taken from the human body, which always has an abundant supply. The body is thus cooled until the air in contact, being saturated, no longer takes up moisture and there is consequently no further absorption of heat. By bringing the fan into play the air next to the body is changed, and as the new supply, although nearly or quite as warm, is *not saturated, the process of cooling is repeated,* and can be kept up at will.

Closely connected with the subject of dew is that of frosts —one which may be made of great interest to the children. Let us imagine ourselves advanced to an October evening with the same conditions of a warm day and saturated atmosphere that prevailed on the June night just described. As the sun sinks low the temperature falls, dropping quite rapidly after sunset, until soon the dew-point is reached and dew begins to form on various objects, as in June. But the temperature drops lower and lower until the freezing point is reached and passed. Then much of the moisture that has been deposited congeals in beautiful crystal formations, and when we look out in the morning we see the earth covered with a coating of white frost. The difference between a white frost and a black one is that the former comes whenever a frosty night has a nearly saturated atmosphere to work upon, while the black frost occurs when the clear sky is favorable for frost, but the dry atmosphere lacks moisture. Black frost is usually more destructive than white frost, and kills plants by congealing their juices. A peculiarity of the earliest light frost of the season is that its effect is often noticed first in the lowest parts of valleys. A field of corn reaching down into a valley will be touched by frost at the lowest point, while the portion higher up will escape injury. This is due to the fact that cold air flows to the lowest possible part of the field and rests there. In this region the vegetation cools by radiation but receives no warm air currents, and therefore cools below the freezing point and is killed, while the warm air, rising to the higher parts of the field, serves to protect the plants in them.

Crystals are of interest when studying frost and its action. When any substance changes from the liquid or the gaseous to the solid state very slowly, thus giving the particles great freedom of motion, the molecules arrange themselves in a definite order about a common center, with their plane surfaces and edges symmetrically arranged about this center. Solids thus formed are called crystals, and ice crystals can be found in plenty on the window panes, where they are seen in various forms. The surface of a newly plowed field is a good place to find ice crystals. If this is not accessible, a corner of the school ground may be dug up, so that the loose soil will form a crystal bed, and be later utilized as a flower bed. Ice crystals can be studied to good advantage from a pan of water set in a freezing temperature if the freezing be arrested soon after it has commenced. The little needle-like crystals crossing each other on the surface may then be explained at leisure. The form of a star crystal may be cut from paper folded crosswise through the center and then folded fanwise along radial lines, and then cut diagonally across the fan. A five-pointed star will result if there are four radial folds. The child will enjoy making stars and looking for crystals like them. In doing this he will be led to notice others unlike them, and thus his knowledge of crystals will be extended. Ice is a mass of closely packed crystals. A child may sometimes ask why ice floats? Water expands when it freezes. Ten quarts of water will make about eleven quarts of ice, but the eleven quarts of ice will weigh no more than the ten quarts of water. Hence, a block of ice placed in sufficient water will float, about one-tenth projecting above the surface of the water. When we see a floating mass of ice or the picture of an iceberg we may recall that ten times as much ice is below as is seen above the surface of the water; the danger to a vessel in striking icebergs may thus be more fully realized.

It may occur to some one to wonder where all the moisture in the air comes from. That the earth is surrounded by a great envelope of air, called the *atmosphere*, we all know. Permeating this is another envelope, composed of invisible particles of moisture, which rise from water everywhere, and which spread in all directions, covering the earth. This is known as the *hydrosphere*. It is denser near the seacoast than in the interior mountainous regions. When we speak of the dry atmosphere of any place, we mean relatively dry, for nowhere is the air entirely free from moisture.

Pupils may be somewhat interested in tracing the path of a molecule of water from the earth to the sky and back again. The evaporation at any place can be noted by setting a vessel of water on the window ledge and protecting it from showers or birds. If the water be measured every day, the amount of evaporation in that particular vessel can be estimated. Let us then watch, in our imagination, a molecule as it leaves the pan in company with many others and is carried upward by warm air currents, which are constantly rising from the earth. Upon reaching a higher elevation, where the temperature is below the dew-point, the vapor becomes visible, and we say clouds have formed. Our molecule perhaps escapes and is carried up and down by various currents, losing its companions here and there, and, finally, at the highest cloud elevation, 5 miles above the surface of the earth, it becomes part of an ice crystal in the white, feathery cloud known as cirrus, familiar possibly to many as "cat's tail," "mare's tail," or, stretching across the sky, as "Noah's ark." From this lofty position our molecule can look down on the silver lining of the intermediate clouds, halfway to the earth, or, possibly, upon the lowest clouds, whose forms are more familiar to us. These we see from below on a warm summer day, when the cumulus, with its many heads, rises like a mountain range, or when the stratus appears, overcasting the entire sky. Another of the lowest clouds is the nimbus or rain cloud, which the wind often drives along so fast that its edges appear fringed, resembling hair blown about. Some of these pieces are torn off by the violence of the wind and are carried on before. These are called scud clouds. Our molecule does not continue to sojourn as part of the cirrus cloud, but when the surrounding vapor or upward currents no longer support the crystal in position it makes its way slowly toward the earth, falling in with warm air currents, which melt it, and at last finds itself a part of a saturated storm cloud near the earth, from which it falls in the form of rain. If it escapes the thirsty rootlets of vegetation, it makes its way between particles of earth to a lower stratum, through which it can not pass, and here, joined by others, it becomes part of an underground vein of water, which bubbles out on some hillside in the form of a clear, sparkling spring. Trickling out from the spring, it is borne on by the brook to the river, and thence to the sea, whence it will soon be again drawn up for another journey in the air.

Lightning and thunder often accompany a storm in summer, and about these the inquisitive child may desire to know. In defining lightning it is not necessary to tell him that it is a discharge between two clouds or a cloud and the earth; do not trouble him with unequal potentials, or opposite kinds of electrification. It will be sufficient to say that lightning is electricity, and he will enjoy the story of how Franklin established this fact. When lightning passes from cloud to cloud it seldom moves in a straight line, but rather in a zigzag path, and hence is called zigzag lightning. Sometimes it goes in sheets from one cloud to another and is then known as sheet lightning. Heat lightning, which we often see on a summer evening, is the reflection upon the clouds of far distant lightning flashes. Many children are afraid of injury during a thunderstorm. Such children may be reassured by the statement that not one person in three hundred thousand is struck by lightning, and that all danger from the flash which they see or whose thunder they hear is already past. The noise of thunder is caused by the flash of lightning forcing a hole or crack for its pathway through the air, which then rushes together again to fill the vacancy after the flash is over, thus causing a crash that reverberates against hillsides, giving us the long, heavy peal.

Another accompaniment of rain, and a pleasant one to consider, is the rainbow. Sir Isaac Newton's explanation will set pupils to thinking in the right direction, and will be of material assistance in the better understanding of the subject when they are mature enough to understand Thomas Young's diffraction theory. Three phenomena must be explained: First, the reflection of light. We are familiar with light reflected from a mirror, which is frequently illustrated by the small boy, who brings a piece of broken looking-glass to school and sends sunbeams dancing around the walls of the room. If a glass two-thirds full of water, containing a spoon, be held about one foot in front of the face with the bottom of the tumbler on a level with the head and you attempt to look up through the surface of the water, you will find that you see nothing except the reflection of the shank of the spoon. If, on the other hand, you hold the glass on a level with the eye or directly above the head, you can see through the water. But when you look through it at an angle the upper part presents a mirror-like, opaque surface which forms a perfect reflector. This illustrates the total reflection of light by water. A second phenomenon is the refraction of light, by which we mean the bending of the rays of light from the original path. This is caused by rays of light passing from a rarer to a denser substance or medium, as it is called (or vice versa). If I take a bowl, place in it a silver coin, and you take a position such that the coin just becomes invisible over the edge of the bowl, you will observe as I proceed to fill the bowl with water, being careful not to move the coin, that you can now see it. This is because a ray of light passing from the coin to the eye is bent or refracted at the surface of the water, and is thus enabled apparently to pass over the edge of the bowl. If at the point at which a ray of light passes from one medium to another a line be drawn perpendicular to the surface of the two objects, this line is called the normal, and it can be observed that light passing from the denser to the rarer medium is bent away from the normal while that passing from a rarer to a denser medium is bent toward the normal. The third phenomenon to be noted is that of the prismatic spectrum. When a ray of white light passes through two inclined surfaces of a prism (a three-sided bar of glass) it is refracted and so broken up that we can see the original colors of which the light was composed. All these colored rays are refracted differently, the red least and the violet most of all, and between these the other colors in proportion. Let us apply these facts to the rainbow. In order to see a rainbow the observer must stand between the sun and the falling shower. The side of the raindrop toward the sun is completely covered by rays, some of which pass directly through the drop while others after entering it are reflected to the eye of an observer standing as indicated at D or E in the diagram.

In Fig. 1, let the circle represent the outline of a rain drop with a ray of light entering at point A. It is refracted on entering the denser medium toward the normal AB, and is also broken up into parts of which the line AR represents the red ray, and AV the violet. These two rays are equally reflected and emerge from the drop at R′ and V′ where they are again refracted, the violet more than the red ray. To an observer standing with his eye at point O there appears to be a red spot in the sky coming from the point where the red ray leaves the water drop while the violet ray passes over his head. But the violet ray from a lower drop enters the eye, and the observer at O will see a violet spot in the sky below the red spot. This is shown in Fig. 2, where two drops are represented as reflecting and refracting the sunlight SR, SV, so that the red ray from the upper drop and the violet ray from the lower drop enter the eye of the observer at E. All the drops on the lower curved edge of the rainbow, BB, send violet rays to the same point, giving the impression of a violet arc in the sky, while all drops on the upper curved line send red rays to the eye, and there appears to be a red arch parallel to the violet one. In between these in proper order are arranged the other colors of the spectrum. But there are other rays entering the drop beside those that enter its upper side. Let us take a ray entering the drop on the lower side, as in Fig. 3. The ray of light, SA, is refracted and broken into the red ray, AR, and the violet, AV, the latter being, as always, refracted most. These are reflected twice by the side of the drop, whence they emerge again refracted at R″O′ and V″O′ with the consequence that the violet ray is below. Now, to an observer standing with the eye at O, a violet light would appear at a point in the sky occupied by this drop, while the red ray R″O′ would pass over his head. From another drop situated at a proper distance below a red ray would appear, thus giving the impression of a red spot below the violet. This is again shown in Fig. 2. The upper drop of water receives rays from the sun, refracting and reflecting these rays as just described, so that the violet rays enter the eye of an observer at E, the drop below this sends him red light, and in the same way the red and violet circles of light appear with the other colors of the spectrum arranged in between. In this rainbow the red color is on the inside and the violet on the outside. In the one first described the colors were reversed. Notice also another difference. In the bow last described there are two reflections within each drop of water, and as some light is absorbed at each reflection this rainbow is dimmer than the other, where there is but one reflection. The brighter bow is called the primary, the other is called the secondary bow.

Most children have observed the echo, or if they have not yet done so, will be much interested in it. As light striking a mirror is reflected, so sound, striking against any flat obstacle, as a cliff, forest, or wall, rebounds. It will be necessary to show that sound consumes an appreciable time in traveling. This can be done by watching a wood chopper as far off as the blows of the axe can be heard. Point out the fact that the sound made when the axe strikes does not reach the ear until the axe has again been lifted in the air for the next blow. A steam whistle also illustrates this very nicely, because its sound is carried so far that the child may be stationed at a point so very far distant that the steam can be observed leaving the whistle sometime before the sound reaches the ear. Consequently it will be quite evident that when traveling straight from its source to the observer, sound consumes some time in its journey. When it is reflected, as in the echo, it follows a longer path and consumes still more time in reaching the ear. When the child comes to understand quite clearly that sound re-

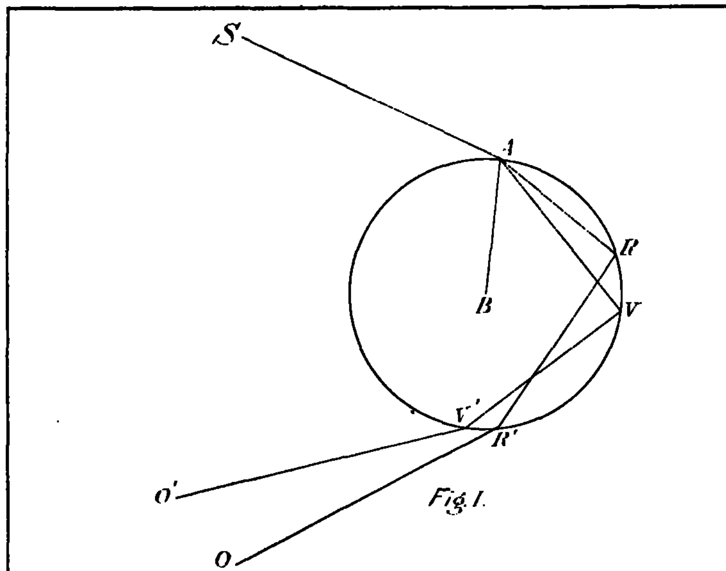

Fig. I.

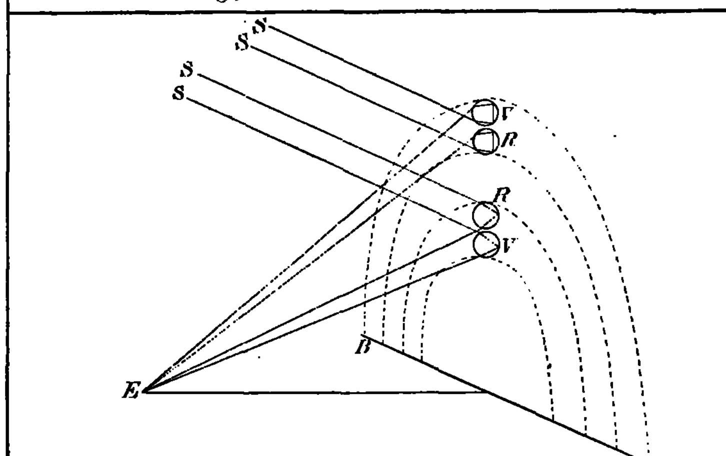

Fig. II.

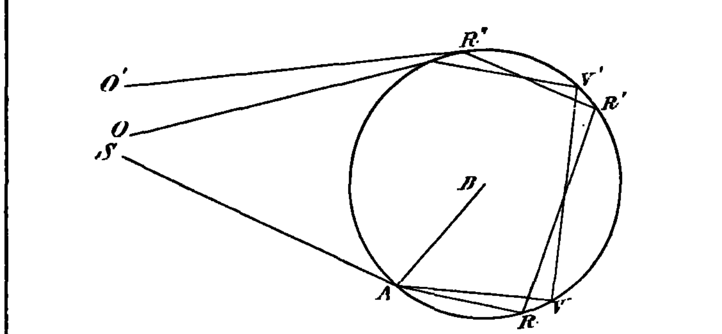

Fig. III.

quires time to traverse space, he can be taught, when a little older, that light also requires time to travel, and that the steam from the whistle was seen before the sound was heard, because the light traveled so rapidly that the time it took had no appreciable value as compared with that required by the sound.

A child is especially interested in anything that he does himself. A daily weather record kept by each pupil can be made helpful in teaching him valuable habits of observation. The following form shows a simple plan for keeping such a record; you can make it more or less complete as you choose:

WEATHER RECORD.

Days of week.	Temperature.	Sky.	Winds.		Weather and precipitation.
			Velocity.	Direction.	
Monday	....	....	....	....	....
Tuesday	....	....	....	....	....
Wednesday	....	....	....	....	....
Thursday	....	....	....	....	....
Friday	....	....	....	....	....

A good time for taking the observations is at the afternoon recess, and these should be placed on record on a sheet of paper by the teacher or older pupils. The records, after being kept for a week may be filed away to be brought out a month later and compared with the record kept at that time. A serviceable thermometer can be purchased for twenty-five cents, and from this the children may be taught to read the temperature. Some boy will be clever enough to construct a simple weather vane, and after ascertaining the points of the compass the child can be taught to describe the winds, which are named north, northeast, east, etc., according to the direction from which they blow.

WINDS.

Name.	Velocity, miles per hour.	Visible effects.
Calm	0	No visible motion.
Light	1-2	Moves smoke from the vertical.
Gentle	3-5	Moves leaves of trees.
Fresh	6-14	Moves small branches and stirs dust.
Brisk	15-24	Makes white caps on open water.
High	25-39	Sways trees and breaks small branches.
Gale	40-59	Dangerous for sailing vessels.
Storm	60-79	Prostrates exposed trees and small houses.
Hurricane	80 or more.	Prostrates everything.

This table describes winds accurately enough for our purpose, so there can be entered on the record the velocity as well as the direction of the wind. The sky is clear when there are no clouds, or cloudy when entirely overcast. The kind of precipitation, as rain, snow, or hail can be recorded, and if it seems desirable, a rain gauge for measuring the amount may be constructed according to directions to be obtained from the nearest Weather Bureau station.

The weather map issued daily by the Weather Bureau of the Department of Agriculture is one of the triumphs of modern science, but it would be impossible without the telegraph. The observations are taken at the weather stations all over the country every morning and evening at 8 o'clock, eastern standard time, which out on the Pacific coast means 5 o'clock. Within twenty minutes the data have been collected and telegraphed to Washington, such messages having the right of way over all others. There the data are collated and the necessary information is sent to the offices where maps are printed. If you will glance at this map that I have hung up before you, you will notice a heavy red line beginning down near Galveston, Tex., and extending around to Cape Hatteras. This is called an isobar and connects places having the same barometric pressure. A little to the left of this is another curve, and you will notice that the figures at the end indicate a pressure of one-tenth of an inch less than at the first. For every variation of a tenth of an inch in the reading of the barometer there is a different isobar. Within the second curve are two others, the inner one of which forms a complete ellipse. In the center of this, near Nashville, you read the word "Low." This means that at that place the barometric pressure is the lowest in all that territory. Looking off to the northwest you will find other isobars which, if the lines were completed, would extend up into British America. Each one of these registers a tenth of an inch higher until you come to the last curve, within which is the word "High." There the barometric pressure is highest.

The accompaniment of the low-pressure area is warm, cloudy, windy weather, with possibly rain or snow. Still, clear, cold, invigorating weather is the accompaniment of the high. Highs and lows drift across the United States in an easterly direction, with an interval between them of about three days or more. Wind always blows from the high toward the low, but not directly. The map shows that the arrows, which indicate the direction of the wind, point from the high toward one end of the low-pressure area. The wind blows to one side of the center in such a way that it circles around the low in a direction opposite to that of the hands of a clock lying face upward on the map. This great circle of winds, moving with more or less velocity, is called a cyclone, and the term is used improperly if applied to any other wind phenomena. The cyclone is not to be confused with the tornado. The latter is only a few hundred feet in width; the cyclone is many miles in diameter. If through the center of the low-pressure area a north-south and an east-west line be drawn intersecting each other, and the temperature in each quarter be averaged, you will find that it is coldest in the northwest section, warmer in the southwest, warmest in the southeast, and cooler again in the northeast. The cyclone transfers heat from quarter to quarter around the low, and thus tends to equalize the temperature. Sometimes it does more than this. During the period when the States in the northwest suffer from a severe cold wave, an area of exceedingly low pressure with a brisk cyclone will carry the extreme cold in an unusual degree southeastward over the southern States. The Weather Bureau, by its study of these facts, can foretell the approach of destructive frosts in time to have all possible precautions taken. The weather map also gives much more information. The arrows are attached to circles, whose centers indicate clear, fair, cloudy, or stormy weather. The dotted lines connecting points of like temperature are called isotherms. At each weather station the temperature is observed with both a wet and a dry bulb thermometer. The dry bulb temperature is that which is read on all ordinary thermometers; the wet bulb temperature is that taken with wet muslin wrapped about the bulb of the thermometer, and is the temperature of evaporation, and is more nearly that which we actually feel, because it is taken under conditions similar to those which exist about the human body when moist with perspiration. Precipitation, in inches, and the velocity of the winds, in miles per hour, are indicated on the map by figures which should be studied carefully.

The Weather Bureau has kindly consented to furnish free to teachers a copy of the weather map daily, for use in the schoolroom, during the months of the school year. As the regular price is $3 per year, this offer is a very generous one, and it is to be hoped that many will take advantage of it.

The Weather Bureau official at Albany, N. Y., Mr. A. F. Sims, has asked me to extend to the teachers of this State a cordial invitation to visit the Albany office and inspect the apparatus and observe the methods pursued.